



CENTER FOR ADVANCED AVIATION SYSTEM DEVELOPMENT (CAASD)

Developing a Model for Joint Infrastructure Investment

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Aviation Industry Economics

“As the legendary investor Warren Buffett famously put it, if he’d been at Kitty Hawk when Orville Wright took off, he would have shot him down as a public-spirited act for the benefit of future capitalists.”

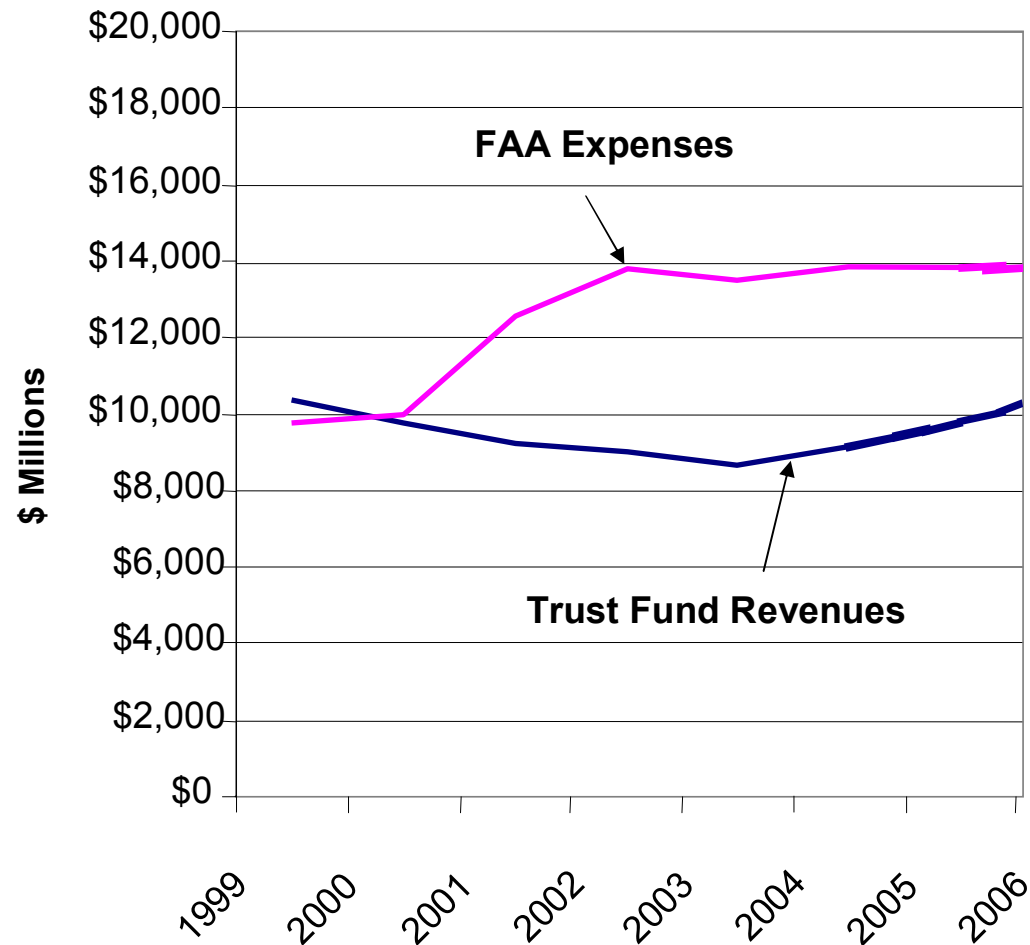
-“Flights of Fancy in Aviation Industry”, REUTERS, 11/17/2003

“Southwest’s net profit per passenger in the last five consecutive quarters since 9/11 was \$2.96. The price of a Happy Meal at McDonald’s is the difference between a profit and a loss.”

-Herb Kelleher, quoted in “Orville and Wilbur Would Cry: The US Airline Industry in 2003”, Professor John S. Strong, 11/2003



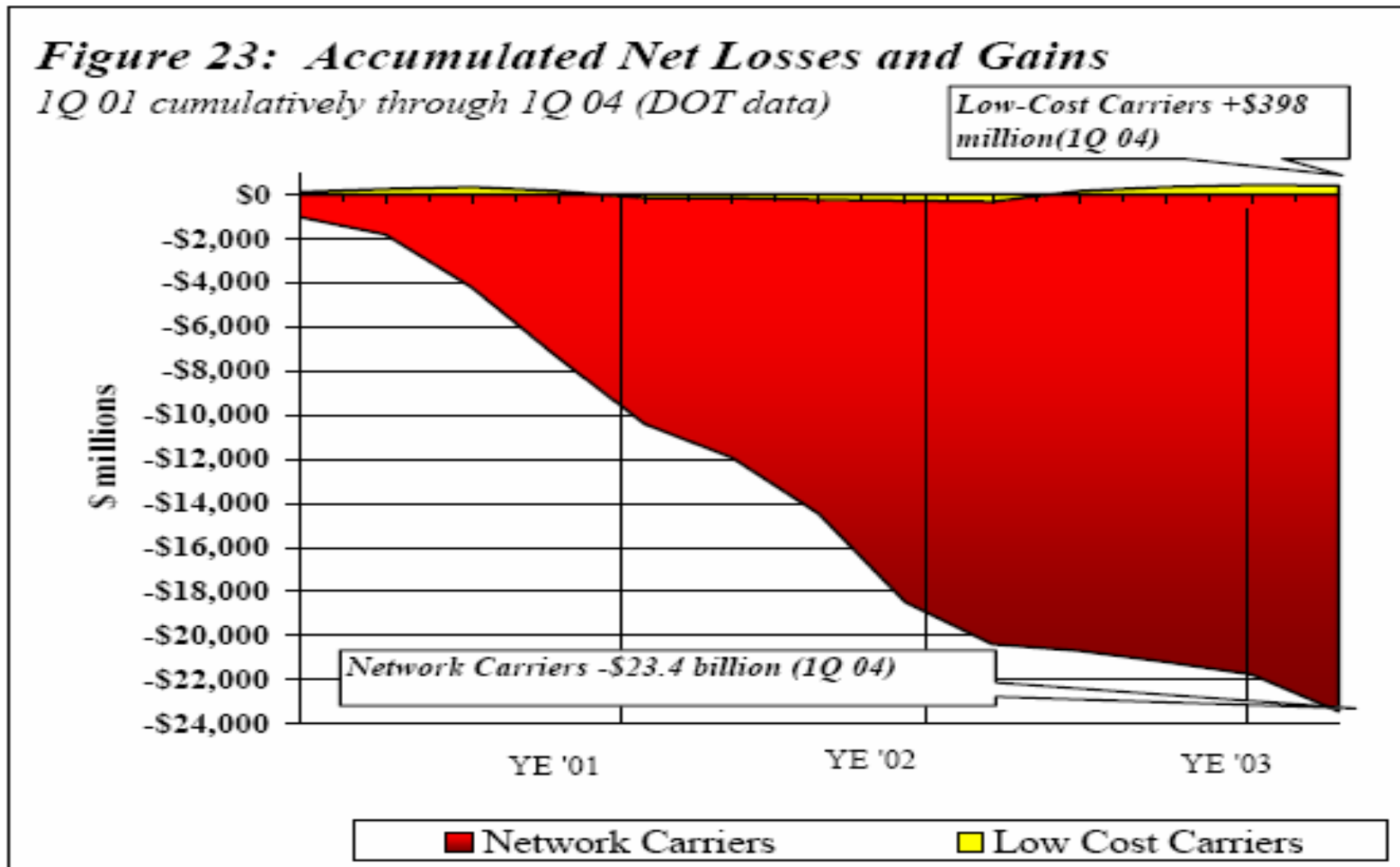
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Source: Briefing, "Trust Fund Revenue Analysis (Work in progress)", Wells, Bhadra, Hogan, MITRE CAASD, 4/8/2005.



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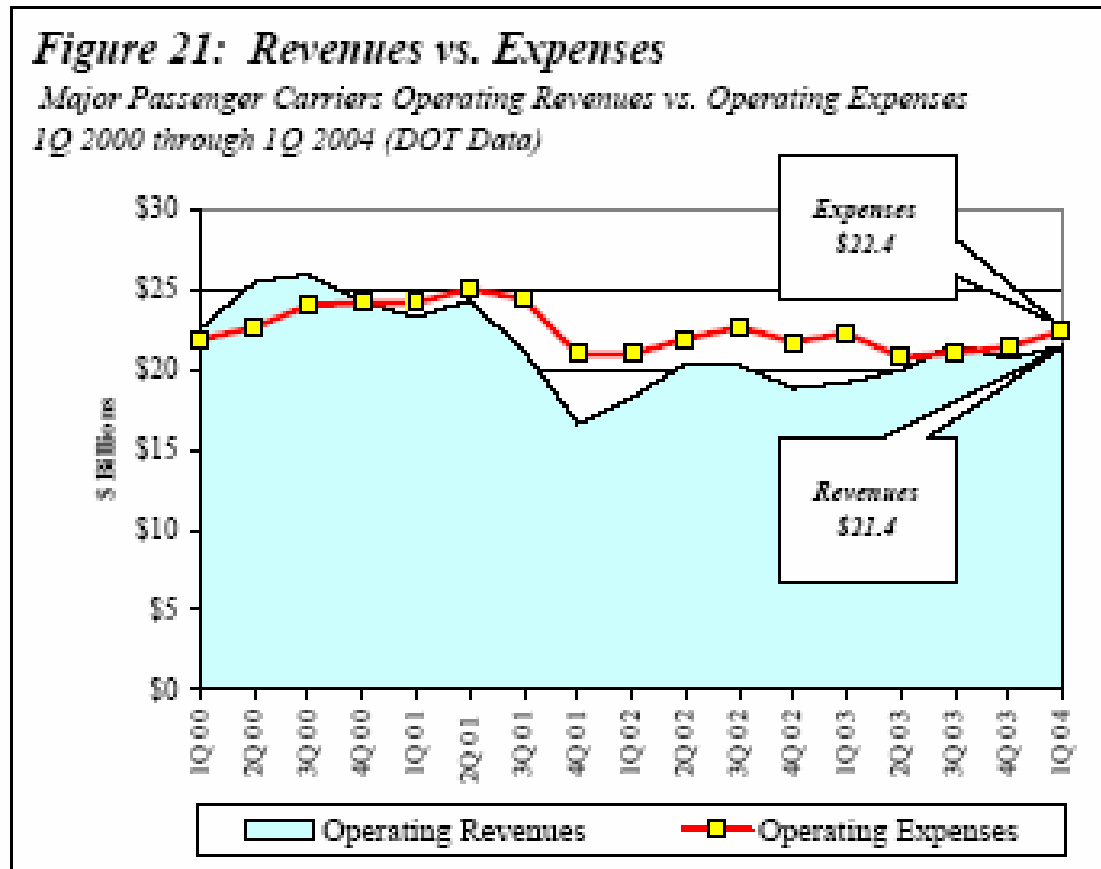


Source: DOT, Office of the IG, "Airline

4 Industry Metrics", August 10, 2004.



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Source: DOT, Office of the IG, "Airline Industry Metrics", August 10, 2004.



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“The U.S. air transportation system as we know it is under stress. The demand for air transportation is outpacing our ability to increase capacity for our airports. Operating and maintenance costs of the air traffic system are outpacing revenues and the air carrier industry is going through significant change.”

- JPDO Next Generation Air Transportation System Integrated Plan 12/12/2004



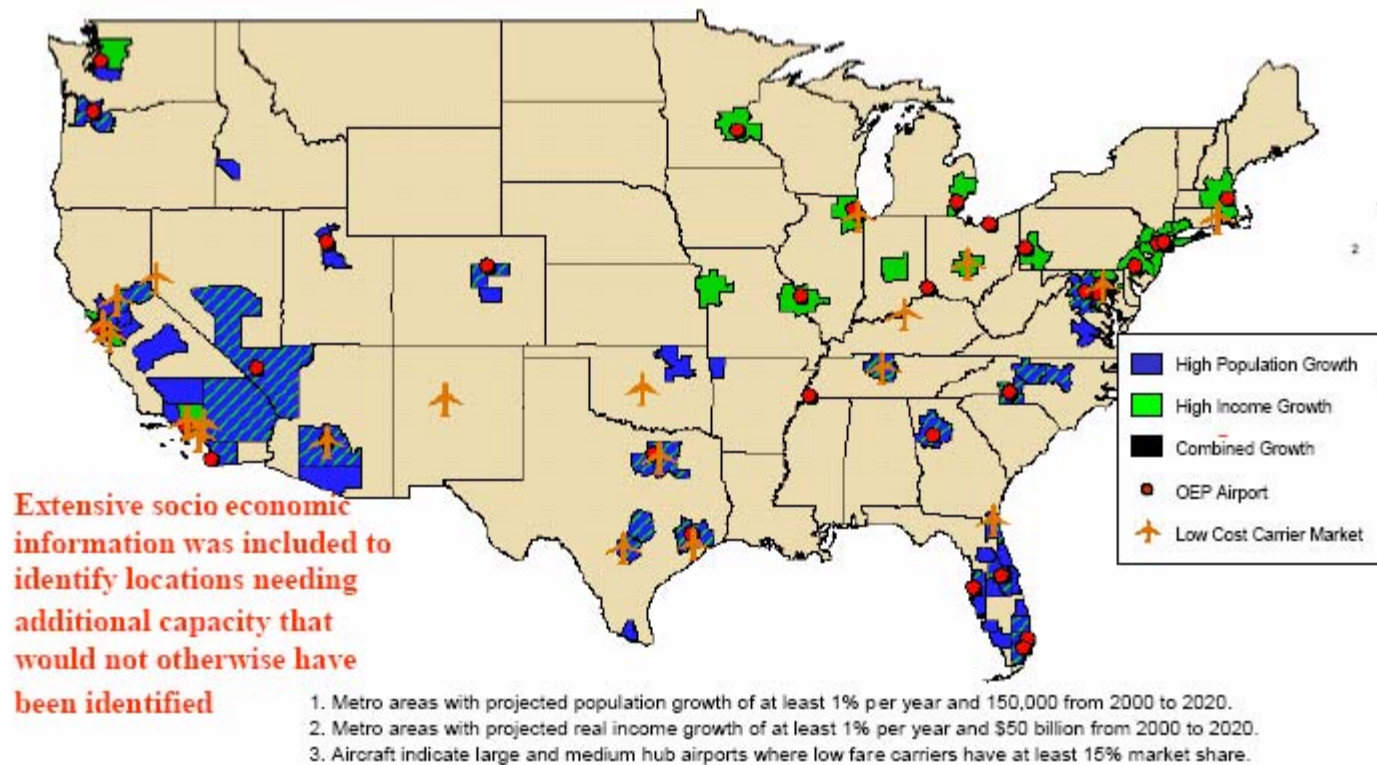
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“However, the [modernization] program has proved to be more challenging than anticipated, in terms of both technology and management, and FAA’s efforts to achieve desired improvements in performance have typically taken longer and cost more than anticipated.”

-GAO Report: “Experts’ Views on Improving the U.S. Air Traffic Control Modernization Program”, April 2005



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Source: "Capacity Needs in the National Airspace System", US DOT, FAA, and MITRE CAASD, June 2004





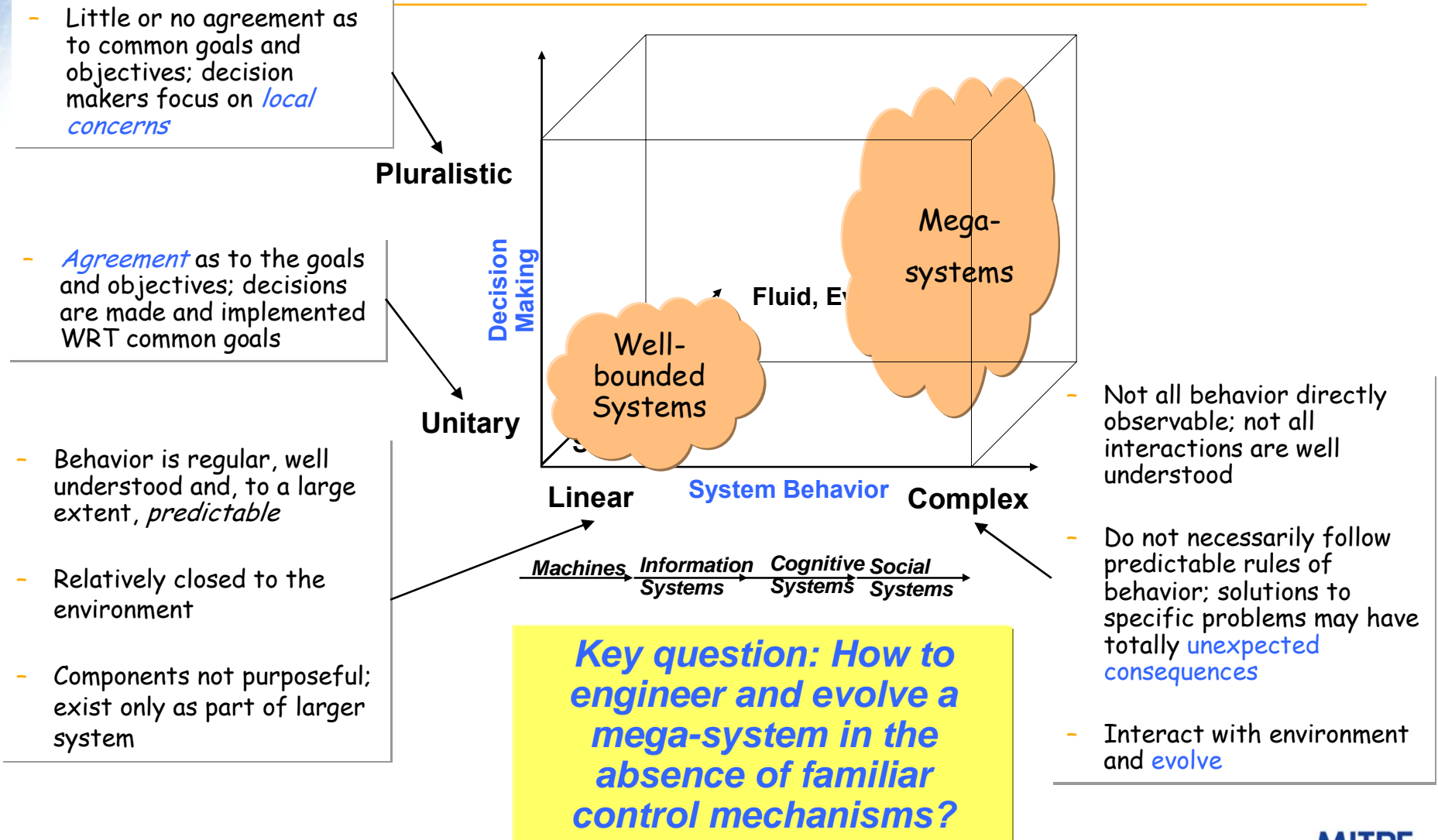
Developing a **Model** for Joint Infrastructure Investment

- Apply same rigor to examining costs as we do to examining system design and requirements.
- Develop the vocabulary and tools for cost-modeling and integrate into systems models.





Developing a Model for Joint Infrastructure Investment





Developing a Model for Joint Infrastructure Investment

- Little or no agreement as to common goals and objectives; decision makers focus on *local concerns*

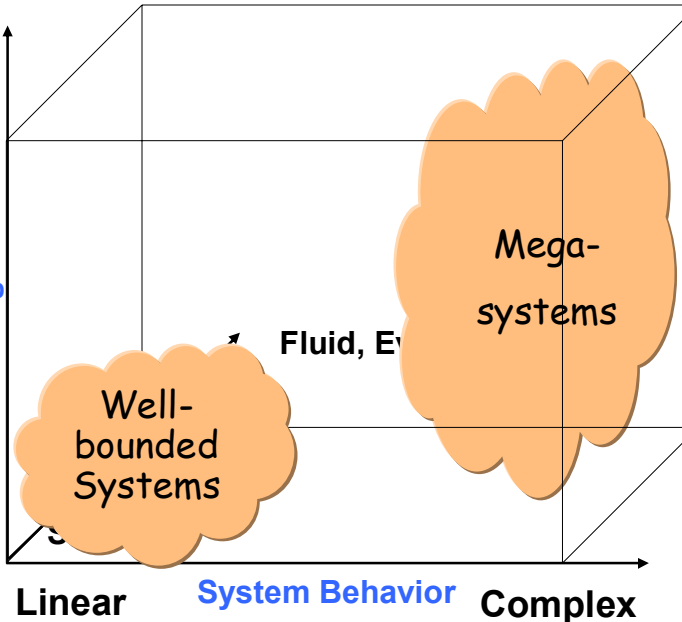
Pluralistic

- *Agreement* as to the goals and objectives; decisions are made and implemented WRT common goals

Unitary

- Behavior is regular, well understood and, to a large extent, *predictable*
- Relatively closed to the environment
- Components not purposeful; exist only as part of larger system

Decision Making



- Not all behavior directly observable; not all interactions are well understood

- Do not necessarily follow predictable rules of behavior; solutions to specific problems may have totally *unexpected consequences*

- Interact with environment and *evolve*

Key question: How to engineer and evolve a mega-system in the absence of familiar control mechanisms?

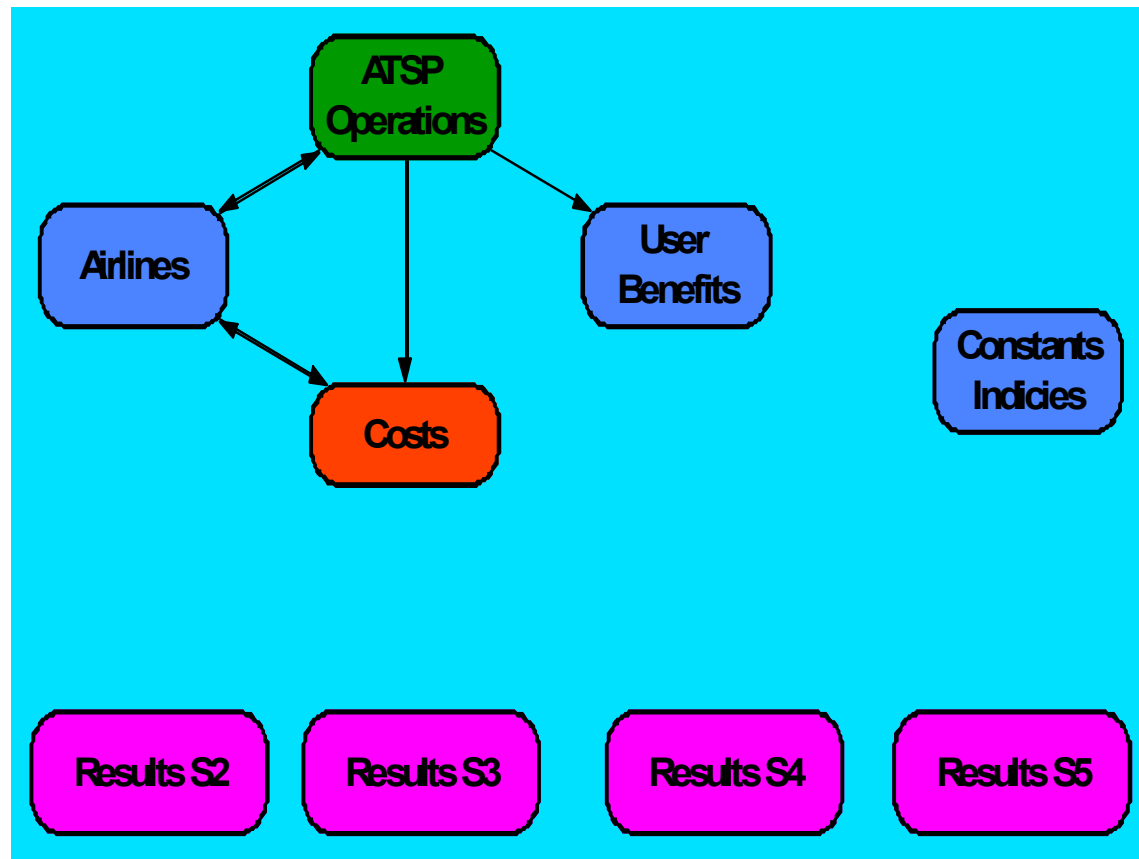


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Model Structure and Capabilities

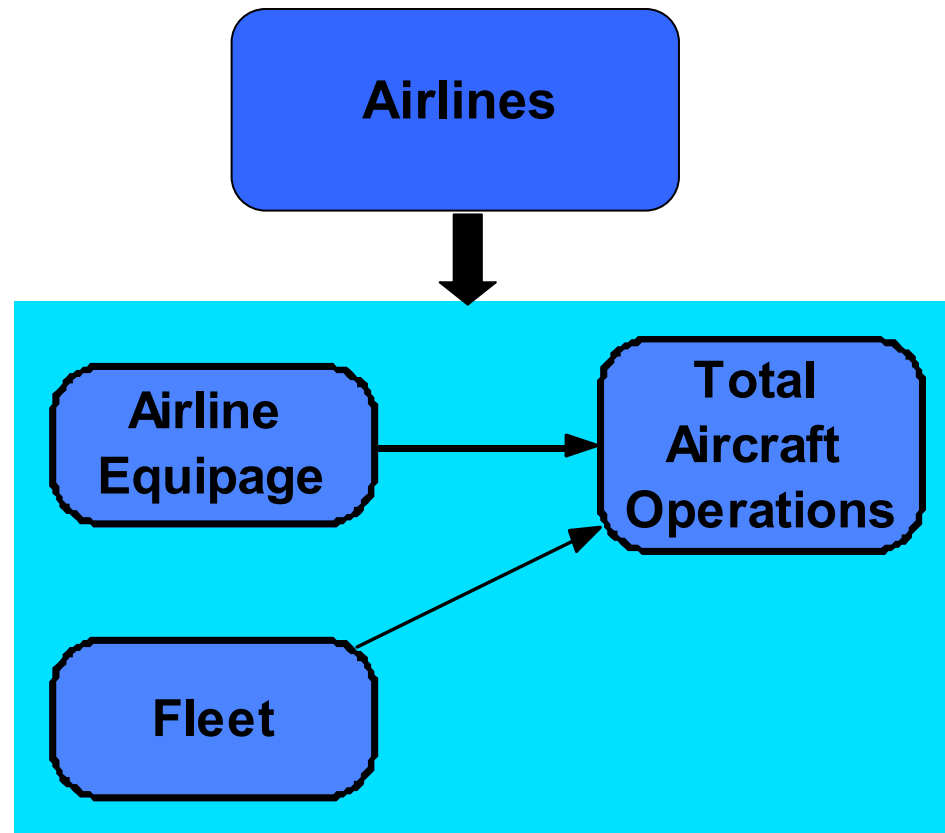


Model Description: Modules



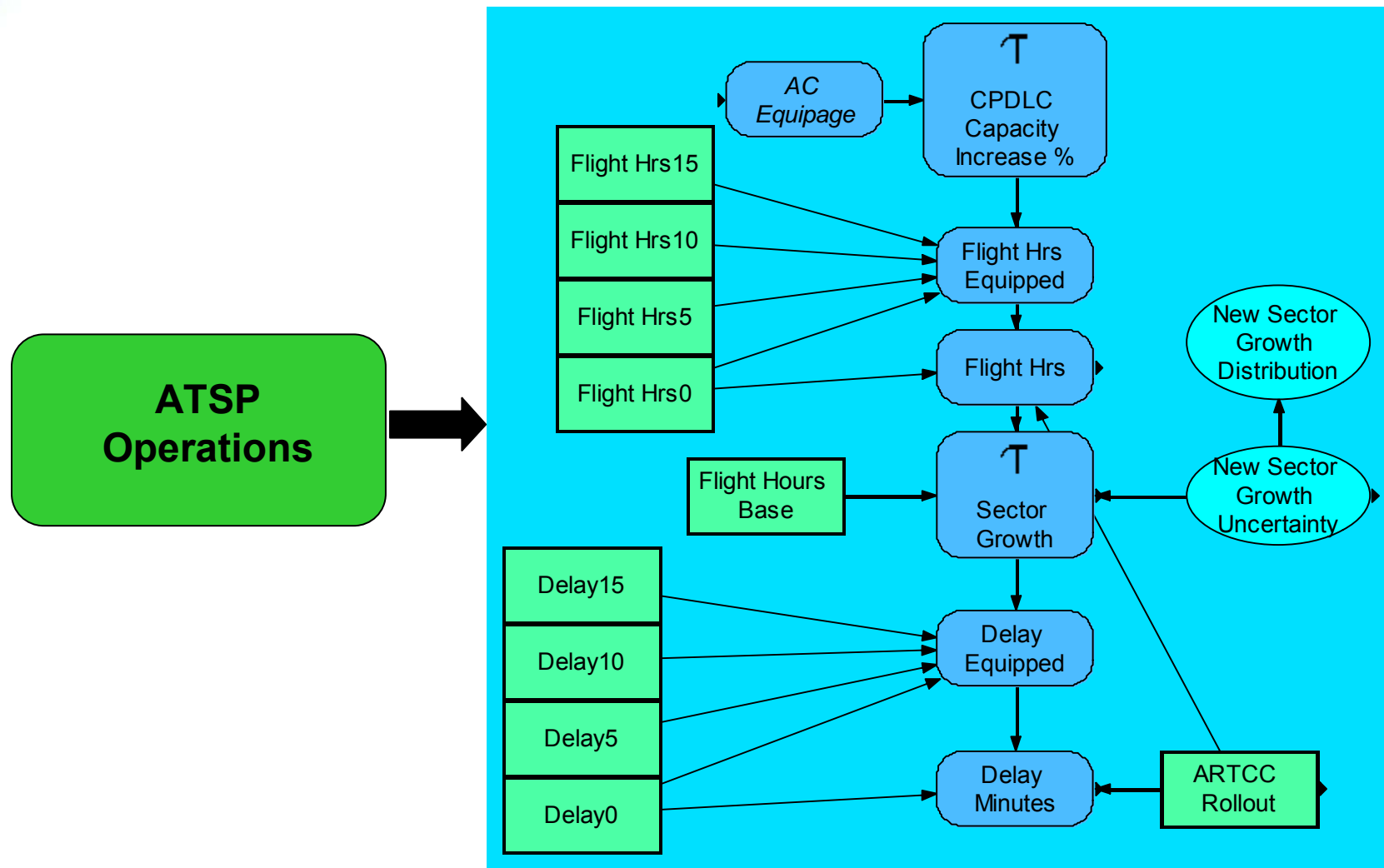


Model Description: Within the Modules



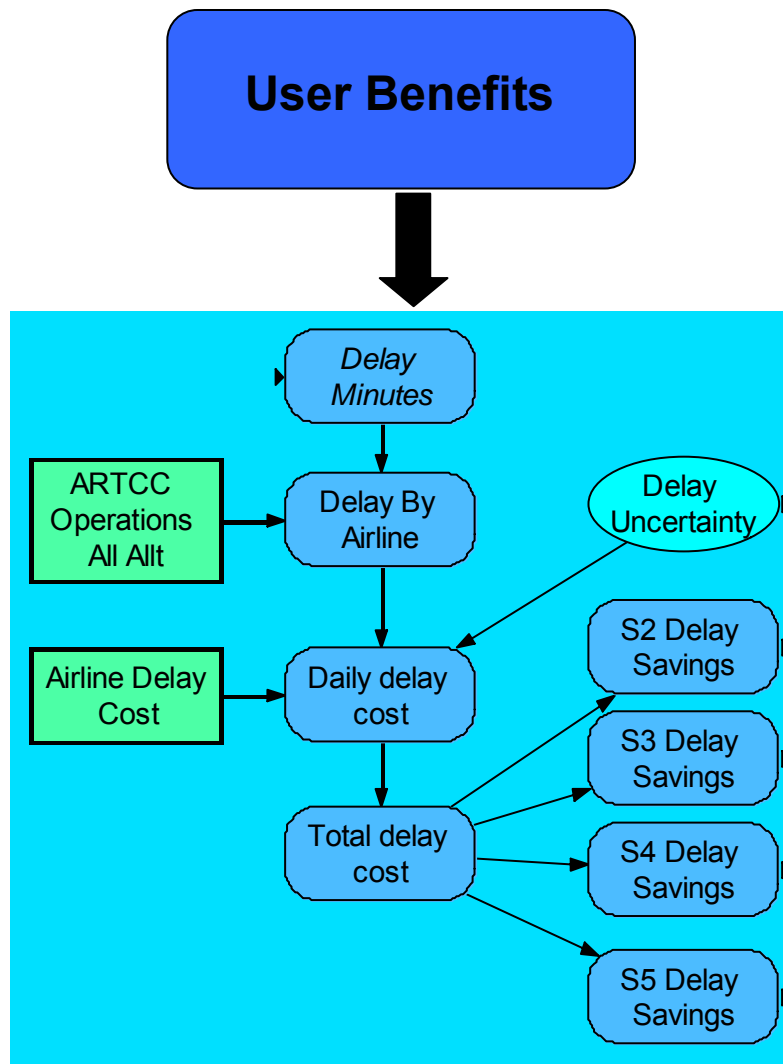


Model Description: Within the Modules



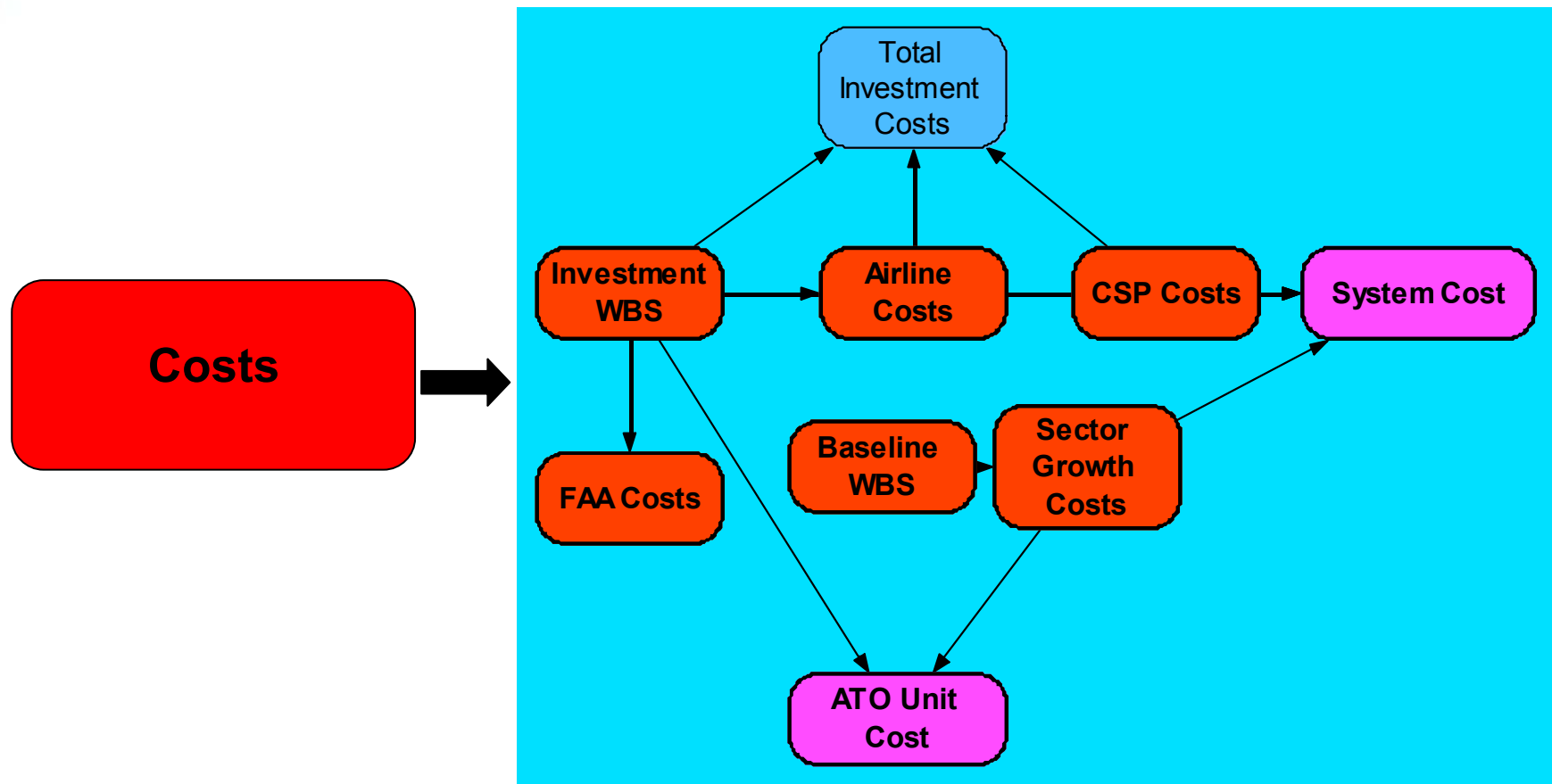


Model Description: Within the Modules





Model Description: Within the Modules



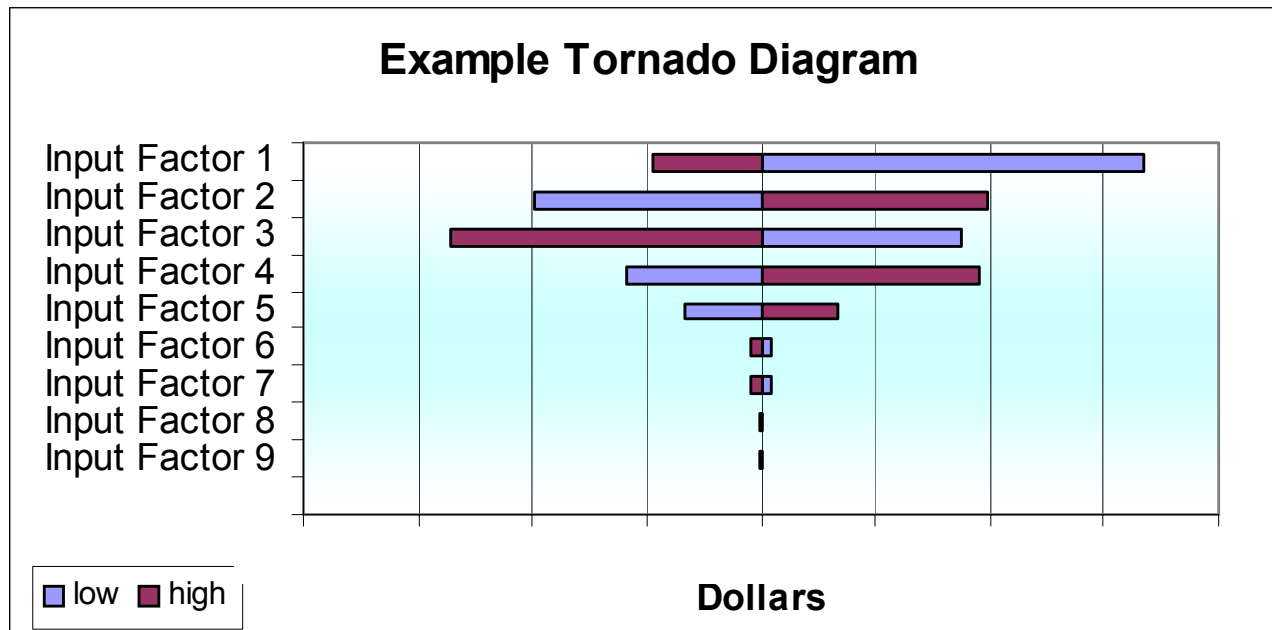


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Model Output

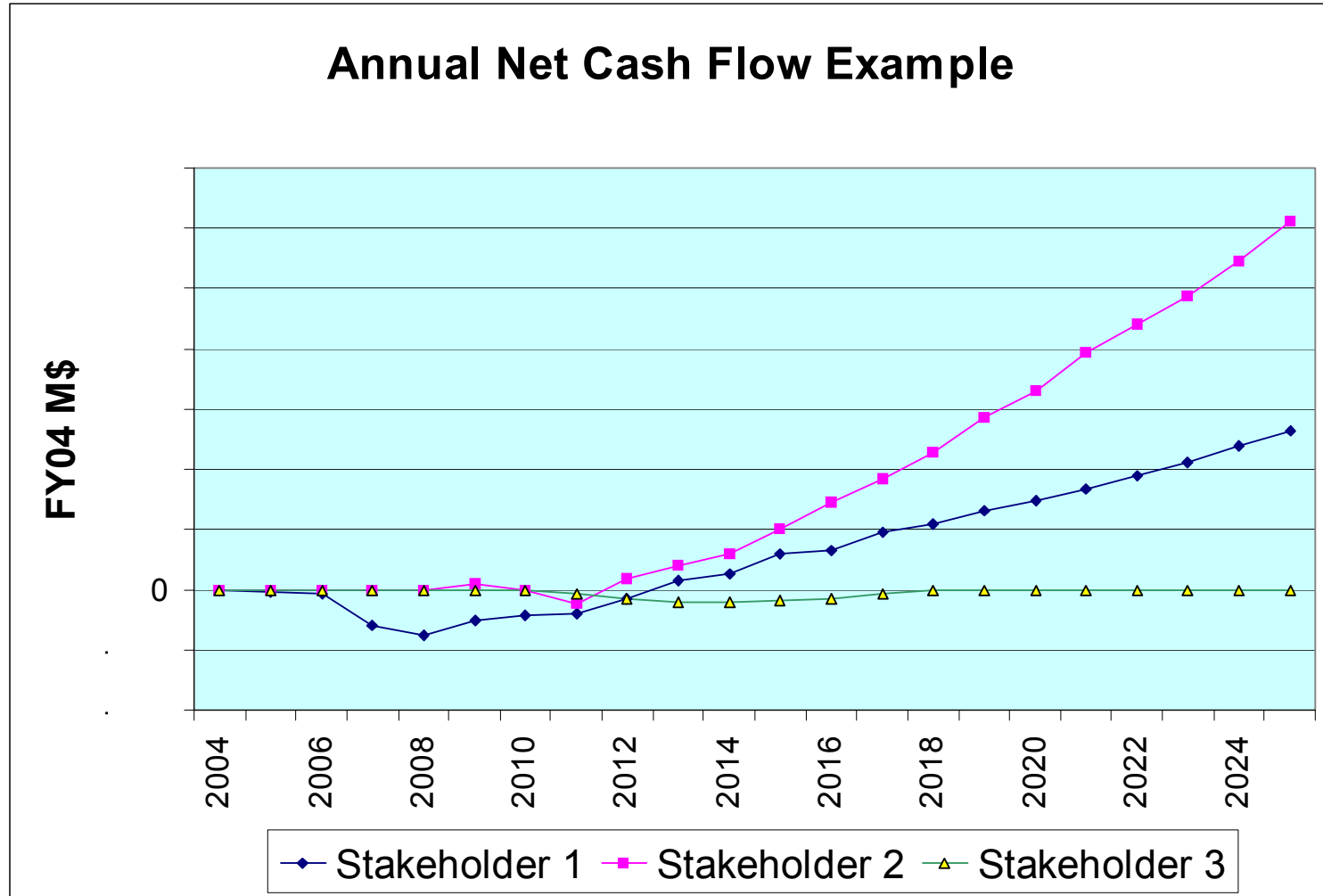


Tornado Diagram





Net Cash Flow





Next Steps



- Investigating sector workload measures and sector growth mechanism.
- Valuing air carrier schedule predictability and user access as benefits.
- Including real options analysis.
- Working toward portfolio-investment analysis applications.
- Continuing validation of methodology and data.



Conclusions

- **Industry efforts to overcome barriers to coordinated financial decision-making are as important as efforts to resolve technological barriers.**
- **It is crucial to investment decision-making that the process be:**
 - Inclusive
 - Transparent
 - Comprehensive
- **NAS modernization decisions should reflect the resource constraints of all stakeholders.**

